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ABSTRACT

This paper describes the implementation and evaluation of a computer literacy program for 4-year-old Head Start students and their teachers that was developed through the efforts of the Indianapolis Head Start program, the Children's Museum, and the Indiana University School of Education. The report covers: (1) the objectives of the program; (2) a schedule of program activities; (3) staff training prior to the program; (4) plans for the implementation of computer sessions; and (5) criteria for the selection of software. The results of the program are reported, including a comparison of the pretest and posttest scores for the correct identification of computer parts by the children in the experimental group and a control group of nonparticipating children. Observations by the researchers of what they learned from the project are also provided, including observations on staffing, volunteers, parents, and university students who assisted with the project; a listing of skills enhanced during the computer experiences; a summary of general problems and concerns; and observations on teacher training. In conclusion, it is noted that the children found the experience exciting and meaningful, and the project engendered considerable parent involvement. (2 tables and 15 references) (EW)

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Computers and Head Start Children: Opening New Doors and Creating Challenges

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ABSTRACT

As educators, we are charged with preparing today's young children for the age of technology. This means computer literacy for all young children especially disadvantaged ones. Through the efforts of Indianapolis Head Start Program, the Children's Museum, and Indiana University School of Education, an exploratory computer program for 4 year old Head Start students and their teachers was developed and implemented during the 1987-1988 academic year. The results indicated positive experiences for children, staff, and volunteers.

COMPUTERS AND HEAD START CHILDREN

OPENING NEW DOORS AND CREATING CHALLENGES

During the past twenty years Head Start programs have offered disadvantaged young children early learning experiences similar to those available to their middle income counterparts. Through these experiences, young children have increased their self-esteem, developed learning strategies and skills, and unlocked the doors for a successful formal school experience. Bowman (1983) stated the case most eloquently as follows:

> . . . we must be alert for the inequalities in our society that are being deepened as we move into the computer age. We must be concerned about poor children who have limited opportunity to use computers in creative and personally interesting ways. The benefits of early and frequent computer exploration is usually denied to children from poor families. Cut off from early and playful use of computers, attending schools that emphasize basic skills, supported by parents and teachers who value conformity, rote learning and individual work, poor children's problem solving education may be seriously deficient and their futures with computers will be seriously compromised (pg. 14).

Currently, computers are becoming an integral component of many preschool classrooms throughout the country (Donohoe, et. al., 1987). As educators, we are charged with preparing today's children for the age of technology. This means computer literacy for all children and the adults who work with them. The resources are expensive, but without them children in already financially strapped programs such as preschools and Head Start fall behind. Children and families from underprivileged and undereducated communities will become the "have nots" of new technology, creating a new level of second class citizens (Bowman, 1983).

In an effort to introduce the Indianapolis Head Start children and their teachers to computers, the Indianapolis Head Start Program, the Children's Museum, and Indiana University School of Education (Indianapolis) discussed the possibility of developing an exploratory computer program. The program would provide opportunities to: (1) educate Head Start teachers and introduce them to computer hardware, software and language, (2) expose four-year-olds to the new era of information and technology, (3) afford parents of these children opportunities to learn about computers as they volunteer, and (4) serve as a field experience for undergraduate Early Childhood students.

OBJECTIVES

For Children

1. To interact directly with the computer hardware and software.
2. To interact with nonclassroom adults, i.e., Museum staff, parents, university students and project personnel.
3. To enhance self-esteem through a growing sense of control over one's environment, an understanding of the computer and the software, and providing for successful learning experiences.
4. To augment the learning activities of the Head Start program.
5. To enhance the development of independence through initiating and controlling the computer environment (making choices).

6. To encourage positive attitudes toward learning and computers.
7. To enhance ability to stay with a task.
8. To promote and encourage development of social skills, i.e., cooperating, sharing, listening, helping, responding and corresponding.
9. To enhance and promote the development of cognitive skills, language development, and communication skills.
10. To offer opportunities for fine motor and eye hand skill development.
11. To provide problem solving opportunities and encourage creativity in problem solving and social interactions.

For Parents

1. To promote opportunities to enhance the parent's role as teacher and participant in each child's education.
2. To provide opportunities for parents to experience the computer, the Children's Museum as an informal learning environment, and their child's success.

For Head Start, Children's Museum, and Indiana University

1. To increase collaboration opportunities.
2. To enhance the university's community outreach efforts.
3. To provide a nontraditional field experience.

SCHEDULE OF ACTIVITIES

In developing the plan for this project we were determined to create a schedule that would not interfere or conflict with regular school routine for staffers and children. Class time at Head Start is divided between a morning group and an afternoon group. We regularly scheduled two groups of children for one hour each on Tuesdays for six weeks beginning October, 1987 and ending June 1988.

STAFF TRAINING PRIOR TO PROJECT

We recognized the necessity of having staff training sessions before we began the project with the children. Baker (1984) supports the necessity of having opportunities for hands-on experiences for staffers prior to introducing their classrooms to computers. Since most of the staffers at Head Start participating in this project had never used or seen a computer before, it was essential that we provide them with an opportunity to become familiar with computer and the software selected for the project prior to dealing with the children and computers together. We recognized the staff's need to pace themselves, confirmed by Anselmo and Zinck (1987), without pressure so they could develop a positive attitude about computers and their own ability to interact with them. Another focus of the pretraining was to stress the role of the teacher at the computer center as a facilitator and problem solver reinforced by Donohue et al. 1987.

As stated by Bowman, (1983). . .

> If computers are to change the education of children, teacher must be responsible for making them a facilitating tool. ...We are already aware of and deeply committed to the notion of children learning to learn, to children's needs to explore their world without undue emphasis on right or wrong answers, to the value of play and collaborative activities, to the faciilitating rather than directive role of the teacher. These are essential principles for teacher's who will teach children to interact with computers (pg. 12)

We envisioned the role of teachers as enabling the children to experience, within their own limits, the computers and software available. The teachers facilitated this interaction by open-ended questioning, modeling, guiding, encouraging and assisting when asked Clements (1987) supports this approach.

With these thoughts in mind we developed a calendar of training activities scheduling one two-hour training session for June at the Museum to captivate and spark teacher interest. Each staffer used an IBM PC junior for exploration of Basic software, the computer, the printer and joystick. They were introduced to the general plans for the project. This two hour session was successful in that staffers attending were excited about interacting with computers, surprised at their ability and interested in the project details. The Museum invited staffers to attend computer laboratory sessions during the summer free of charge.

SUBSEQUENT STAFF TRAINING SCHEDULE

In September, we scheduled training session for teachers and assistants participating in the project. Participants included: 4 teachers, 4 teacher assistants, 3 foster grandparents (assigned to the classrooms we were using), Rochelle Cohen,(Education Coordinator), Jacqueline Blackwell, (Indiana University), Susan Swenson, (Computer

Instructor) and Anne Ray, (Director of the Museum Computer Center).

Ms. Swenson was the computer instructor employed by the Museum and Head Start to implement this project. Her responsibilities included staff orientation and training sessions, hands-on preschool class activities, and implementation strategies. Recognizing that hands-on computer experiences were essential for both groups, she planned sessions to provide staff with an opportunity to experiment with each of the software packages we would use with the children, to review the logistics and goals for each session, and finally to share strategies and ideas to supplement laboratory experiences in the classrooms. In addition, she scheduled sessions focusing on evaluation of each computer class, problem solving, discussion of strategies/techniques, staff concerns, and problems generated during a particular computer class session as needed during the course of the project.

Schedule

Session I focused on an introduction to the Museum, the laboratory and computer software. The software was demonstrated and experimentation opportunities with BASIC were provided. The pretest was administered and class instructional packets and notebooks were distributed. Overall goals and objectives were distributed.

Session II reviewed the first computer session with the children, identified strategies and goals for the next session, and offered hands-on time in the laboratory.

Session III was an opportunity to review and evaluate previous sections.

Session IV, V, and VI provided opportunities for staffers to share and evaluate the computer experience. Plans for the future were explored.

PLANS FOR AND IMPLEMENTATION OF COMPUTER SESSIONS

Since planning for the children's sessions was important, we wanted to plan enough to meet our objectives and avoid pitfalls and problems that could be predicted. We focused on the following areas.

1. Computer awareness introduced the children to the computer. From our assessment it was clear that none of the children had previous experience with computers. We talked with them about computers in the community, discussing places where they might have seen computers or evidence of computers: library, supermarket checkout counter, game room, bowling alley, bank or on television.

2. The children were introduced to terminology relevant to the computer (cursor, computer, disk, disk drive, printer, keyboard, program, monitor, joystick, Muppet Keys, Kindercomp, Hodge Podge, computer laboratory, end, escape, enter, arrows, right, left, up, and down). Each week keyboard functions were reviewed. The "hot potato" motion was stressed since many of the children would press a key and not release it. We also reinforced the idea that when the red light was on you didn't touch the computer at all because it could ruin the program.

3. Some children have difficulty with moving from one site to another. A transition from Head Start to the Museum was planned. Singing the computer song, created by Ms. Swensen to the tune of the "Farmer in the Dell," provided a transitional time. Then, Ms. Swenson would introduce and demonstrate the new software for that session and review information from the last session. The demonstration included active participation by the children whenever possible.

4. In order to facilitate movement in the computer laboratory, the children were divided into groups of five using tags with the symbol of a

monitor, disk drive, keyboard, or joystick. Each group was assigned a particular program in the computer laboratory (much the same as the learning centers). The programs were Number Farm, Hodge Podge, Muppet Learning Keys, and Big Bird. The children experienced each of the programs available that session in fifteen minute segment.

5. Distractible children unable to attend or disinterested in the particular computer activity were given an alternate activity choice (i.e., blocks or chalkboard). Children were encouraged to walk over to a friend who was working and work with him/her as long as it didn't bother the friend. (This happened more with certain groups of children and may be a function of their classroom environment rather than the computer experience.)

At the end of the experience, the children talked about what they had done that session, and plans for the next week were shared. If time permitted, the computer song was repeated.

6. Immediately after each session strengths and weaknesses were identified and modifications were explored by the Program Staff.

CRITERIA FOR SELECTION OF SOFTWARE

The Museum's Computer Coordinator assessed the software she had used with young children and developed a list of possible programs. Then Program Staff reviewed the goals for the project and narrowed the field of possible programs further. The objectives that related specifically to software selection were:

-to have experiences with multiple input devices

-to have experiences with various menus

-to use the cursor as part of the program

-to experience the repeating capabilities of the computer

-to experience using the printer

-to reinforce number, letter, and color skills

-to encourage communication and language development

-to enhance social development through the computer

-to experience success/independence

-to develop a positive attitude about computers

Limits inherent to the project that further defined the type of program we could use were:

-Age and developmental levels of the children vary within a group.

-Feedback for correct responses should be more motivating than feedback for incorrect responses to encourage further exploration.

-The software must be durable and withstand the use/abuse of four-year-olds over a period of 48 one hour sessions.

-There should be a high level of interest appeal, especially in graphics.

-The software should allow for some exploration and creativity with. with multiple levels of difficulty and feedback.

-The program should fit into the time schedule of approximately 15 minutes.

-The audio part of the program should not be distracting or disturbing.

Programs selected were Hodge Podge, Number Farm, Big Bird and Muppet Learning Keys.

RESULTS

A major thrust of the computer project was to provide an opportunity

for Head Start children to interact with and learn about computers. To measure whether or not we reached our goal for computer literacy, we devised a simple matching activity to use as a pre and post test. The instrument consisted of seven drawings of computer parts. The parts selected were a printer, monitor, joystick, keyboard, disk drive, disk and zebra code bands. The children were asked to point to the part identified by name by the tester. After the children had pointed to the part they selected, they were given a particular color crayon to use to color that item. For example, for the first item the tester said, "Point to the object that you think is a joystick." The child points to one of the objects on the page. "Color the joystick red." Each object had a corresponding color. The items were administered in the same order for both the pre and post test. The instructions were given in the same manner for each test. Each of the groups of children participating in the computer project was pre tested during the same time period beginning on September 29 and ending on October 15th. A control group was matched for each of the classes participating in the project. The control groups were other Head Start classes of four-year-olds <u>not participating</u> in the project. These groups were pre and post tested during the same period of time.

Comparison of results for those classes participating in the project indicated that the children were able to recognize a majority of the computer parts on the test after their computer experience. Not only were they better able to identify the parts, they often identified the parts before the tester gave them their instructions. The control groups showed little change in their ability to identify computer parts. Results are shown on tables A and B.

COMPARISON OF PRE AND POST TEST INFORMATION

TABLE A

SCORES FOR CLASSES PARTICIPATING IN THE COMPUTER PROJECT

Item	Pre-test					Post					Gains				
	X1	X2	X3	X4	X5	X1	X2	X3	X4	X5	X1	X2	X3	X4	X5
Joystick	12	12	6	8	6	17	14	15	13	14	5	2	9	5	8
Monitor	1	3	3	1	5	15	13	13	14	14	14	10	10	13	9
Disk Drive	4	4	0	0	4	13	11	12	2	12	9	7	12	12	8
Zebra Code	1	0	0	0	0	8	7	10	5	5	7	7	10	5	5
Disk	4	4	1	3	3	11	7	8	6	11	7	3	7	3	8
Printer	2	1	1	2	6	8	10	7	6	8	6	9	6	4	2
Keyboard	0	1	0	4	0	16	14	12	12	13	16	13	12	8	13
Total # of Children	14	18	15	15	15										

Scores represent the total number of correct responses for each item by the children who were participants in the computer project.
Gains represents the increase in correct response to an item compared to the pre-test response.
The "x" designation represents classes participating in the project.

TABLE B

SCORES FOR PRE AND POST TESTING OF CONTROL GROUPS

Item	Pretest					Post Test					Gains				
	C1	C2	C3	C4	C5	C1	C2	C3	C4	C5	C1	C2	C3	C4	C5
Joystick	15	14	11	14	12	12	9	11	8	12	-3	-5	0	-6	0
Monitor	6	2	1	7	3	0	1	2	0	2	-6	-1	1	-7	-1
Disk Drive	3	3	1	2	1	2	5	4	0	1	-1	2	3	-2	0
Zebra Code	0	0	0	0	0	1	1	1	1	0	1	1	1	1	0
Disk	3	8	0	3	2	2	2	0	2	1	-1	-6	0	-1	-1
Printer	0	0	1	3	0	4	3	2	3	1	4	3	1	0	1
Keyboard	3	3	0	0	1	3	2	1	2	2	0	-1	1	2	1
Total # of Children	16	17	19	19	16										

Scores represent the total number of correct responses for each item by control classes. Gains column represents the change in score per item from the pre to post test. A negative number (-) indicates that there were fewer correct responses at the post-test than during the pre test. The "C" represents classes that were control groups.

THINGS WE LEARNED FROM OUR OBSERVATIONS

Children need instruction, a roadmap, prior to entering a new environment. Children are less frustrated initially if adults are nearby to answer questions and offer assistance when needed. This sets the tone for the experience. This finding is supported by Clements (1987).

The children's responses to the programs varied from none to uncontrollable laughter and smiles to no apparent emotion. Williams (1984) observed the same behaviors.

Using computers with children as young as age 3 is developmentally appropriate and documented by research (Beeson & Williams, 1985; Forman, 1986) and our experience. Furthermore, these children experience high degrees of success.

Interactive software promoted peer helping, sustained interest, and encouraged problem solving confirming the work of Paris & Morris (1985) and Hyson (1985). Increased verbal interactions between children was commonplace rather than the exception. The following remarks often were heard during a computer period:

"Move over and I'll show you!"
"How did you do that? I want it too."
"Wait! Press! See!"
"I did it."

Low adult-child ratios made a difference in the successful implementation of this experience for Head Start children.

Children from structured classrooms encountered more difficulty coping with the freedom available in the computer laboratory and spent more time exploring the limits and elements of the new environment. Children from less structured classrooms welcomed the opportunity to use the computer. They listened for instructions and quickly started the selected program.

These children knew what to expect from each session due to the preplanning and follow-up activities provided by their classroom teachers.

OBSERVATIONS

Staff

Some staff members initiated follow-up activities in their classrooms. For example, a computer learning center was constructed as reinforcement of the Museum experience in the housekeeping center in one classroom. Field trips were planned to the supermarket, banks, toy stores etc. to see evidence of computers in action.

During the computer sessions some teachers allowed the children to solve problems while others told the children what to do. Questioning techniques varied among the staff. Some teachers placed coming to the laboratory as a high priority and did whatever was necessary to arrive on time. Others arrived late which created a rushed atmosphere because the laboratory was often scheduled immediately after the class ended. These observations have raised interesting questions about selection of participants and training for next year such as: What incentives should be used to create teacher interest in the project? How should teachers be selected?

Volunteers

Volunteers consisted of parents accompanying their Head Start Children and Early Childhood students from Indiana University. While they were anxious to assist, they often didn't understand that one of our goals was to encourage helping behaviors and communication among the children in the computer environment. Since our volunteers were often unavailable for training and practice sessions, they would required the children to stay in their seats and not talk to each other.

Occasionally, they would do the program for the children or supply answers and assistance when it was not required or solicited.

Parents

Parents tended to help their own children. Often, they started doing the program while the child observed. Sometimes, parents did not understand the child was ready to move on to another program. Many parents wanted to see what their child was learning but had reservations about assisting. They preferred to sit on the side and quietly observe the whole group without offering to help.

Indiana University Students

Most of the students had completed an introduction to micro-computers as a part of their degree program prior to this project. This experience allowed them to be valuable assets to the project and reinforced the importance of training for adults who work with young children, thus supporting the work of Anselmo & Zinck, 1987. (They participated in all scheduled staff training session.) The students had the opportunity to observe how young children interact with computers, each other, and adults in a non-classroom setting. This added a new dimension to their field experiences.

The students had the opportunity to put into action the textbook readings regarding child development and demonstrate their ability to be open minded and flexible when working with young children.

The students became aware of individuals who differ in background (cultural and economic) and responded to children as children not "poor" children (Bowman, 1983).

SKILLS ENHANCED DURING COMPUTER EXPERIENCES

SOCIAL - cooperation, sharing, working in diads and small groups, peer helping, listening, co-responding and responding, taking turns, leadership, enhancement of self-esteem, sense of pride and achievement

PROBLEM SOLVING - logical thinking, step-by-step techniques, exploration, trial and error, experimenting with options, concentrating and staying with a task, transferring of knowledge from one situation to another

COGNITIVE - identifying, classifying, ordering, matching -(letters, numbers, directions, sounds), discriminating, recognizing (number, letter, and color), number concepts (counting, one-to-one relationships, less than and more than), sound recognition, same and different, ability to work with symbols, grouping, vocabulary (computer terms and labels), word recall, sight words, phonics, sentence and word meaning

COMMUNICATION SKILLS - listening, speaking opportunities, vocabulary development, and pre-reading experiences

FINE MOTOR - visual acuity, eye hand coordination, visual discrimination

SELF ESTEEM - successful experiences, independence, environmental control, leadership roles and increased creativity

GENERAL PROBLEMS/CONCERNS

The selection of computer instructor was vital to the success of this program. In thinking through the qualifications for this person the following criteria, in order of their importance, were established:

experience with young children

experience with computers

experience in informal learning environments

demonstrated ability to work with adults and children

flexible and adaptable

committed to the project goals/objectives

sense of humor

More time must be spent in preparing and training the staff for their interaction with computers. The ideal situation would be to utilize the same staff members for a second year of the project while adding one or two additional staffers.

In the future, selection of staff, will require a committment of a specific number of practice hours and some level of competence with computers after the training for each participating teacher and teacher assistant.

Due to mechanical breakdowns, we are seriously considering eliminating the joysticks and Muppet Keyboards as input modes as supported by Forman (1986).

In addition, all staffers involved in the project should assist with selecting the software, preferable new programs will be more interactive and creative. More instruction for the children prior to moving into the laboratory is essential. If sessions are skipped due to bad weather or unforeseen problems, we should review the previous sessions.

Although we realize the scope of the project is limited, we feel that some experience with and exposure to computers is better than none confirming the research of Bowman (1983).

Transporting the children to the Museum - the buses were often late causing delays in the schedule. Although many different strategies were tried to eliminate this problem, we did not succeed. We feel that the most committed teachers were more successful in getting their groups to the Museum on time. The only solution or non-solution is to remain flexible in scheduling. Consideration must be given to the possibility of including children from other sites that are further away. This would compound the transportation problems.

TRAINING OF TEACHERS

Undergraduate teacher education programs must prepare students to work with diverse populations. Field experiences, an integral component of a quality teacher preparation program, must provide varied opportunities for Early Childhood undergraduate students to interact with young children of diverse cultural and economic backgrounds in school and non-school settings. Through the collaborative project of the Indianapolis Head Start program, Children's Museum, and Indiana University School of Education (Indianapolis), Early Childhood students worked with disadvantaged young children and their parents in a non-school setting. The experience increased each student's knowledge of individual differences and child development, showcased career options (Museum employment possibilities), accomplished the community outreach mission of the University, and enhanced the implementation of an on-going computer research project.

CONCLUSIONS

The children found the experience exciting and meaningful. In addition, we were able to get large numbers of parents into the Children's Museum and the computer laboratory, to observe and assist in this project. We are hopeful that the sense of pride the parents felt in their children's accomplishments, and the degree of comfort they and their children experienced at the Museum will carry over and encourage them to continue to use this informal learning environment.

If young children are to unlock the doors to the future, we must give them the necessary tools. Computers are such a tool and an opportunity to be a part of the mainstream. Practitioners must be willing to explore and accept the role of computers as an additional tool in programs for young children. Young children surely deserve this gateway to the future.

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